**Date\_10/22/12\_\_ Time\_\_1:02\_\_ Subject Passive Transport Grade\_10\_**

**Pennsylvania/National Standards:**

* Keystone Anchor
  + BIO.A.2.2: Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e. atoms, molecules, and macromolecules)
* PDE SAS
  + S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).
  + S11.A.1.1.5: Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).
  + S11.B.1.1.1: Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).
  + S11.B.1.1.3: Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).
* National Science Education Standards
  + Standard C 1.1: Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

**Essential Understanding(s)/Key Concepts/Skills:**

* Passive transport involves moving substances into and out of the cell without the cell using any energy.
* Osmosis, diffusion, and facilitated diffusion are all types of passive transport

|  |  |
| --- | --- |
| **Instructional Objectives** | **Aligned Assessments** |
| 1. Given a graphic organizer, the student will compare/contrast the types of passive transport with 80% accuracy.  2. Given a list of types of passive transport, the student will identify and explain them with 80% accuracy. | 1. Graphic organizer.  2. Mid-term exam questions, Unit project |

**Review of Skills/Content:**

The information learned in the previous lesson regarding the cell membrane will be reviewed before this lesson. Students will need to recall the information they learned about the structure of the cell membrane and its functions.

**Materials:**

* Teacher computer
* Passive transport PowerPoint
* Student notes handouts
* Passive transport videos
* Passive transport graphic organizer handout
* Student gummy bear activity handouts
* Bag of gummy bears (at least 20 gummy bears)
* 18 plastic cups
* Water
* Sugar
* Salt
* Masking tape
* Markers
* Plastic wrap
* Paper towels
* 6 rulers
* Balance

**Behavioral Expectations:**

Students will be expected to follow all posted school and classroom rules. Students will be expected to pay attention to the teacher and respect the teacher and classmates at all times. Since the students will be working in groups, they will be expected to actively participate in group work while maintaining focus and staying on-task. Students will also be expected to clean up their lab areas after the activity. The activity will be completed later in the unit (Lesson 4), so students will be expected to place their materials in the back of the room and leave them there until they are instructed to finish the activity during day 4.

**Methods of Assessment:**

The lesson objectives will be formatively assessed during the lesson through the use of informal questioning. At the end of the lesson, the teacher will do a visual check for completion of the students’ graphic organizers. There will also be questions regarding the information learned in this lesson on the unit exam. The lab activity sheets will be collected upon completion of the activity and handed back to the students on day 4 so they can complete the rest of the activity. After the completion of the activity on day 4, the students will hand in their completed lab sheets which will be graded.

**General/Specific Accommodations for Students (Diverse/English Language Learners):**

In order to accommodate English language learners and students with special needs, access to classroom aides such as textbooks will be provided so students may look up words they are unfamiliar with. The instruction will be delivered clearly and concisely. Responses to questions may be modeled and extra time may be given to complete assignments. Students will be allowed to work in groups and may be allowed to hand in a single lab sheet for the entire group. The lab handouts and notes will be read aloud to aid students with visual impairments and copies of pre-filled note sheets may be provided if necessary.

**Instructional Sequence:**

|  |  |
| --- | --- |
| **Lesson Implementation** | **Anticipated Student Responses** |
| **Introductory Activity (Anticipatory Set):**  The anticipatory set will include a set of Keystone exam vocabulary words that relate to the lesson including diffusion, facilitated diffusion, and osmosis. The students will be given approximately 10 minutes to define these terms by looking up the definition in their textbooks.  The class will then review the daily objectives which will be written on the board. | Once the students arrive in the classroom, they will be expected to sit down, take out their books and notebooks, copy down the vocabulary words, and write definitions for them in their notebooks.  The students may not begin to work on their vocabulary right away, so it will be important for the teacher to keep them on task. |
| **Modeling/Demonstration:**  To begin the modeling/demonstration, the teacher will gain the students’ attention by passing out guided note handouts and starting the notes PowerPoint. The PowerPoint will guide the students through the types of passive transport, including diffusion, osmosis, and facilitated diffusion. The teacher will demonstrate how the students will identify the missing words from their handouts and insert the proper terms from the PowerPoint presentation slides. | During the modeling/demonstration, it is expected that the students will follow the instruction and pay attention to the instructor. Some students may lack attention so it will be important for the instructor to make sure to maintain student focus during this time.  The students should copy all of the PowerPoint notes onto their notes sheets. Depending on the level of student and teacher discretion, the teacher may perform a notebook check in order to make sure the students have copied down all of the required information.  Some students may not participate in note-taking and may not maintain focus on the PowerPoint. The teacher should try to keep the students focused by making the notes interesting. |
| **Guided Practice/Feedback:**  The teacher will then hand out the passive transport graphic organizers to the students and ask them to use their notes to help them fill in the important information for each type of passive transport.  Once the students have completed their graphic organizers, they will be moved into their lab groups and asked to share their organizers with their group mates. This will give them a chance to get feedback on their organizers and correct any mistakes they may have.  Student attention will then be called back to the teacher who will ask students to share what they placed in each spot of the graphic organizer so that the class as a whole can collaborate and correct the graphic organizers. | The students should fully participate in the guided practice and to use the feedback provided by the teacher to guide their learning and help them understand the concepts being taught.  Some students may not participate in the discussions, so it will be important for the teacher to elicit responses by asking students who agree with the statements other students made to raise their hand or some other form of response.  Moving the students into groups could cause some of them to get off-task. The teacher will have to closely monitor the students during this time to ensure a smooth transition. |
| **Independent Practice:**  After the students have completed their graphic organizers, the teacher will do a quick visual check for completeness. The teacher will then hand out the gummy bear osmosis/diffusion activity sheets and ask one student from each group to get all of the required supplies. This activity will provide the students with independent practice of the topics covered in this lesson, but will not be fully completed until lesson 4 (see lesson 4 plan).  During this lesson, the students will follow the instructions on the handout to set up the activity and then they will make predictions about what they think will happen when gummy bears are put into water, a salt solution, and a sugar solution. These predictions should be based on what the students have learned about passive transport throughout the lesson. | The students will be expected to participate fully in the activity with the members of their group and to keep the lab area as clean as possible.  Some students may not want to participate in the activity. The teacher will have to make sure all students are participating equally and sharing ideas.  Some students may make a mess of the lab area when doing their lab activity. The teacher will have to supply paper towels for the students to clean up the area when they are done. |
| **Discussion/Essential Questions:**   * What is passive transport? * What are some examples of passive transport? * Why is passive transport important for cells? | The students should be able to answer these essential questions by the end of the lesson. |
| **Formative Assessment:**  The formative assessment for this lesson will consist of the students’ answers to informal questioning throughout the lesson as well as their completed lab handout which they will turn in at the end of the period. The graphic organizers will also be a formative assessment. The information gained from these assessments will allow the teacher to make sure students understand the key concepts being covered in the lesson and adapt future lessons. |  |
| **Closure (Review/Preview):**  To close this lesson, the students will be asked to share their ideas about what will happen to their gummy bears in each type of solution while relating it to the topics covered in the lesson. This will provide the students an opportunity to think about all of the information they learned throughout the lesson and put it all together. | The students should participate in the discussion and should provide their own unique input. They should also think critically about the information they learned over the course of the lesson. Some students may not participate, so the teacher should guide them into discussion by asking if they agree or disagree with other students. |
| **Extension Activities:**  The extension activity that will be used if the lesson is finished before the end of the period will consist of giving the students pieces of paper and asking them to create vocabulary flash cards for the terms covered in the lesson and then review them with their partners. | The students should maintain focus while completing this activity, but some may lose focus since the period will be almost over. The teacher will need to help maintain student focus. |

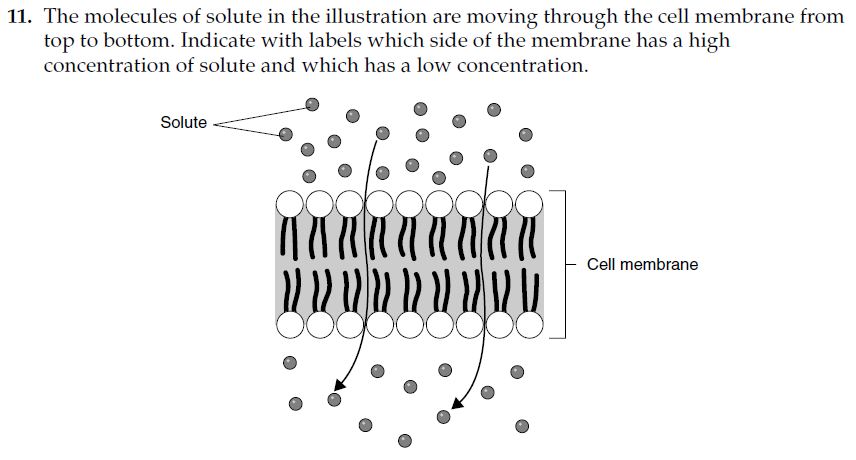
**Correction Procedures/Potential Areas of Difficulty:**

One area I see students possibly having trouble with this lesson is distinguishing between osmosis and diffusion. It will be important to emphasize that osmosis involves water.

**Summative Assessment:**

**Assessment Items**

1. A red blood cell placed in water will swell and burst because of the movement of
2. Salt from the red blood cell into the water
3. Water into the red blood cell
4. Water from the blood cell into its environment
5. Salts from the water into the red blood cell
6. Which of the following does not require energy?
7. Passive transport
8. Active transport
9. Endocytosis
10. Exocytosis
11. The molecules of solute in the illustration are moving through the cell membrane from top to bottom. Indicate with labels which side of the membrane has a high concentration of solute and which has a low concentration.



Match the situation to the description:

1. The solution is above strength in the solute
2. The solutions are the same strength
3. The solution is below strength in the solute
4. \_\_\_\_Two solutions are isotonic
5. \_\_\_\_A solution is hypertonic
6. \_\_\_\_A solution is hypotonic

Match the following terms to their definitions:

1. Osmosis
2. Movement of water through a selectively permeable membrane from high to low concentration
3. Molecules pass across the membrane through cell membrane channels from high to low concentration
4. Particles tend to move from an area of high concentration to an area of low concentration
5. Diffusion
6. Facilitated Diffusion

**Answers and Scoring Criteria**

1. B (1 point)
2. A (1 point)
3. (2 points) Top has high concentration, bottom has low concentration
4. B (1 point)
5. A (1 point)
6. C (1 point)
7. A (1 point)
8. C (1 point)
9. B (1 point)

\*Also, see final unit project handouts in lesson 8\*

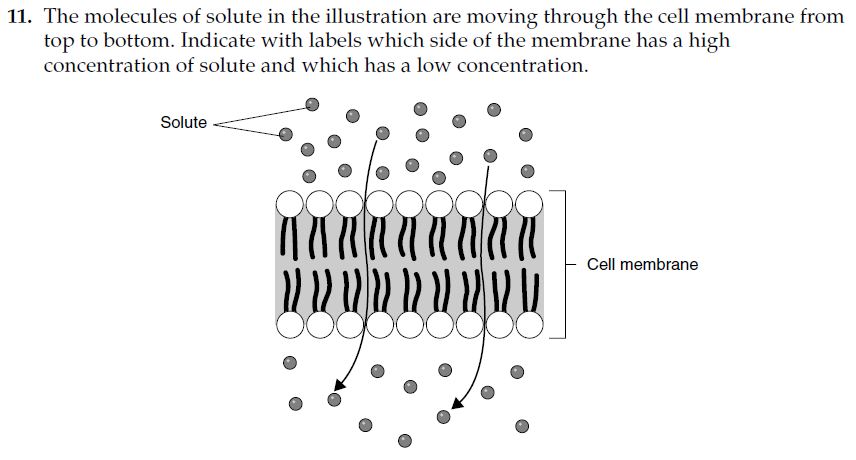
**Modified Assessment Items for Students with Disabilities and English Language Learners:**

1. A red blood cell placed in water will swell and burst because of the movement of a. Salt from the red blood cell into the water
2. Water into the red blood cell
3. Salts from the water into the red blood cell
4. Which of the following **does not** require energy?

a. Passive transport

b. Active transport

1. Endocytosis
2. The molecules of solute in the illustration are moving through the cell membrane **from top to bottom**. **Indicate with labels** which side of the membrane has a **high concentration** of solute and which has a **low concentration**.
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



Match the situation to the description:

1. The solution is **above** strength in the solute
2. The solutions are the **same** strength
3. The solution is **below** strength in the solute
4. \_\_\_\_Two solutions are **isotonic**
5. \_\_\_\_A solution is **hypertonic**
6. \_\_\_\_A solution is **hypotonic**

Match the following terms to their definitions:

1. Osmosis
2. Movement of water through a selectively permeable membrane from high to low concentration
3. Molecules pass across the membrane through cell membrane channels from high to low concentration
4. Particles tend to move from an area of high concentration to an area of low concentration
5. Diffusion
6. Facilitated Diffusion

**Reflections:**

**Sources:**

Melgaard, K. (n.d.). Investigating osmosis using water and gummy bears. *SERC*. Retrieved October 6, 2012, from <http://serc.carleton.edu/sp/mnstep/activities/26990.html>